

# Effect of Deep and Superficial Heating Combined with Self Static Calf Stretch Exercise among Adults with Heel Pain and Reduced Ankle Dorsiflexion-A Randomised Control Study

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## Abstract

**Background:** The use of thermotherapy is been practised in the domain of physical therapy. Patients with heel pain which is caused by composite factors still prevalent so, usage of right modality for treating the pain, facilitating the muscle to stretch thereby increasing range of motion (ROM) for dorsiflexors is needed. This study was also done in perspective of reducing logistics and fiscal matters for both patients and therapists.

**Objective:** To empirically prove whether short wave diathermy (SWD) or wax therapy increases dorsi flexion of the ankle joint and a significant reduce in heel pain.

**Methodology:** A hundred samples whose ROM of dorsiflexion is less than or equal to 17 degrees was recruited for the study and divided into two equal groups randomly.

**Results:** Effectiveness of Wax bath and SWD was tested separately and it gave a statistically significant improvement in ROM and decrease in pain. When the two interventions compared the group receiving SWD gained more ROM and self-perceived pain was less.

**Keywords:** Thermotherapy; Diathermy; Treatment

## Introduction

Plantar heel pain is the common symptom which can be caused by calf muscle tightness so exploring the effective treatment protocol becomes inevitable [1]. Plantar heel pain is considered to be most prevalent not only with sports persons but also with common people practicing sedentary life style. This is caused by various determinants like being obese and people related with long time standing in their work place [2]. When treatment considered in the domain of physical therapy the use of modality is common but selecting the right type of modality is not a trivial issue because it involves recovery time and affordability to the patient. Commonly used devices for treating are short wave diathermy and wax bath to the calf and heel region. A research study done in 2010 has revealed that using of pulsed short wave diathermy has yielded good gain in range of motion at ankle joint and in self-perceived improvement in daily functions [3]. On the contrary the use of wax bath for treating heel pain is followed and in a study done in the year 2000 among patients with scleroderma has revealed that patients sought to wax bath as a treatment for their heel pain [4]. This implies that for other conditions like plantar fasciitis also wax therapy is commonly used [5]. A meta-analysis done in America has showed that the manual stretching protocols was effective when compared with control or with other intervention group and stretching of plantar fascia is more significant in reducing heel pain [6].

## Objective of the study

To empirically prove whether short wave diathermy (SWD) or wax therapy increases dorsi flexion of the ankle joint and a significant reduce in heel pain. The findings of this study may prove useful for physical therapists in considering the right modality.

## Materials and Methods

A sample size of 100 whose age fell between 18 to 35 years was selected after screening for inclusion and exclusion criteria. Subjects with less than or equal to 17 degrees were recruited. ROM were recorded by goniometry. The samples were divided into 2 groups equally each group having 50 samples. Statistically, more than 30 samples can yield meaningful results. Allocation of patients for intervention groups were selected through simple random sampling without replacement. A verbal consent was obtained from each patient after describing the protocol in detail. Ethical committee approved this study after a thorough perusal. The outcome measures were ankle dorsiflexion and visual analogue scale (VAS) for self-perceived experience with pain. Ankle dorsiflexion with knee in flexed position was recorded by another investigator who was kept blind about the patient's intervention group. Self-static stretch exercises were thought by a physiotherapist to all the patients and the therapists was made blind about the type of intervention each patient going to get. The follow up regarding compliance with exercise protocol was followed by telephonic conversations [7]. Data entry done in MS-Excel and analysis was done using SPSS 22.

## Results

In this study the overall participation of female subjects was 37 percent. Around 46.2 percent of the subjects who received SWD treatment with self-stretching exercises reported that their pain has reduced significantly. Whereas the subjects who were receiving wax therapy around 38.5 percent reported that the pain was moderate after the intervention and 57.7 percent from the group said that they didn't encounter relief of pain at all. To assess the efficacy of treatment in both groups paired t test was done and found that both groups subjects showed some increase in range of motion which was statistically significant. Mean for group 1 is 0.540 (C.I lower 0.756 to upper 0.324, p-0.000) and the Mean for group 2 was 3.980 (C.I 4.384 to 3.576, p-0.000). Same analysis was done on VAS with respect to group 1 yielded a Mean of 0.900 (C.I 0.505 to 1.295, p-0.000) on the contrary group 2 fetched a Mean of 5.420 (C.I lower 5.105 to upper 5.735, p-0.000). By these results it is made sure that wax therapy and SWD can be used for treating heel pain on the other hand we must ascertain the best modality to treat among the two so, independent t-test was applied here to see the results. When considering the independent t-test analysis based on gained ROM it was the group 2 which was more effective than the group receiving wax therapy, (t-9.714, C.I lower 3.011 to upper 1.989, p-0.000) (Table 1). The same statistical analysis was made based on VAS results which revealed that the group receiving SWD experienced reduction in pain faster than the group 1 subjects (t-21.780, C.I lower 4.690 to upper 5.630, p-0.001) (Table 2).

Type of Intervention	Mean	C.I	p
Wax therapy	0.540	0.756-0.324	0.000
SWD	3.980	4.384-3.576	0.000

**Table 1:** Showing mean values of ROM along with its confidence interval and level of significance.

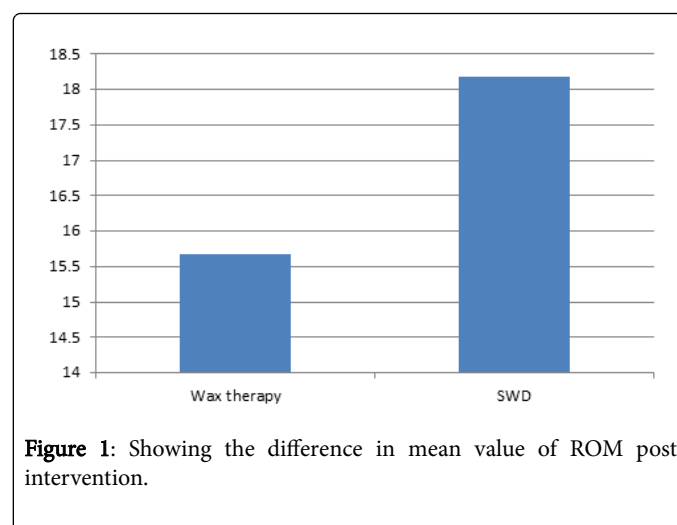
Type of Intervention	Mean	C.I	p
Wax therapy	0.900	0.505-1.295	0.000
SWD	5.420	5.105-5.735	0.000

**Table 2:** Showing mean values of VAS along with its confidence interval and level of significance.

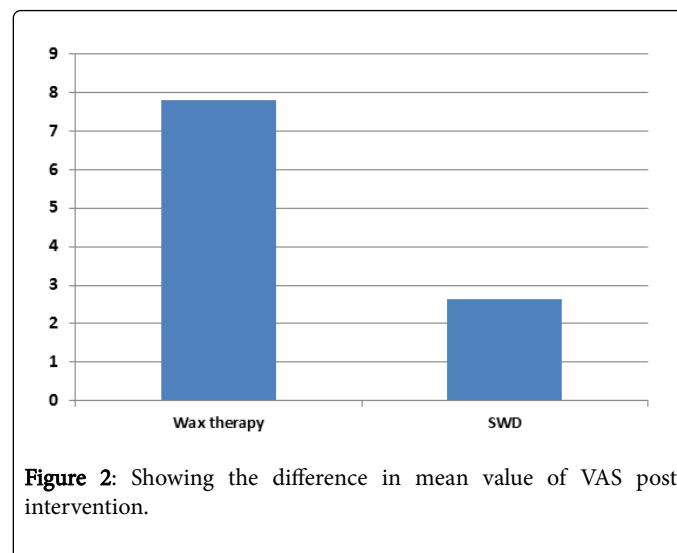
## Discussion

Utilization of thermal agents for reducing pain and improving joint range is being practiced for a long span of time. The basic ideology behind using of thermal agents was it improves blood circulation, loosens the tight fascia and improves ROM. Also application of heat or cold affects the pain sensation perceived at neurological level [8]. Generally thermal therapy is grouped into two they are, superficial heating modalities and deep heating modalities. In this research wax bath was selected for superficial heat agent and Short wave diathermy for deep heating purpose. A research study did in 2004 have published their results which supports the use wax bath along with exercise protocol for reducing pain and increase in ROM among Rheumatoid Arthritis patients when compared with application of just hot packs [9]. Following this in this study also there is a statistically significant difference observed in the group which had wax bath and self-stretch as an intervention in both improvement in ROM and decrease in heel

pain. When considering the short wave diathermy which falls in the category of deep heating technique the penetration of the heat is deeper when compared with wax bath. A study which used microwave (deep heat) as an intervention explored that deep heating agent can provide relief from pain and enhances cell repair process. This research also yielded the result in concordance with this study which got published in the year 2007 [10]. When perusing the stretch protocol which is used as the treatment and sometimes prescribed as a way of life by therapist is effective in many cases because it tends to relieve spasms and tightness of a muscle. Stretching also increases ROM, reduces the risk of injury and the functional well-being of an individual. There are previous studies which have found that application of deep heating method will help the muscle to stretch beyond its pre intervention level [11]. So the deep heating method will be more effective than superficial heating (Figures 1 and 2).



**Figure 1:** Showing the difference in mean value of ROM post intervention.



**Figure 2:** Showing the difference in mean value of VAS post intervention.

## Conclusion

Both the intervention groups had some post treatment effect but, when analysing the effectiveness in decreasing pain and improving ROM of Dorsiflexion the use of deep heat therapy (in this case SWD) is found to be effective. This result will allow physical therapists to choose the wise modality for patients so that it will be effective on

logistics dimension for both the therapist and the patient. In the epoch of 'Evidence based Practice' this research will be thought provoking and solid evidence tested empirically.

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